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# COMPUTER GRAPHICS DICTIONARY

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edited by

Roger T. Stevens



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Hingham, Massachusetts

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## frame buffer

tion time, the game allocates a single memory block from the operating system, which will be used and managed by the frame memory system. This memory block is allocated only once throughout the lifetime of the game and is released back to the operating system just before the game terminates. From the memory block's pointer, we compute the base and cap memory pointers, optionally aligning them to a memory boundary that fits the specific system the application was designed to run on. The base pointer points to the lowest aligned memory address in the memory block, and the cap pointer points to the next higher-aligned memory address just outside the top of the memory block. The memory block, the base pointer, and the cap pointer remain constant throughout the life of the game. Finally, the lower heap frame and upper heap frame pointers are set equal to the base and cap pointers, respectively. These two pointers change as allocations are made during the course of the game. A call is made to the system, requesting a chunk of memory from one of the two heaps. If the lower heap is specified, the lower heap frame pointer is bumped up by the amount allocated, and its value prior to the modification is returned. The lower heap frame pointer always points to the next available byte of memory. If, on the other hand, the upper heap is specified, the upper heap frame pointer is decreased by the amount allocated, and the new value is returned (because the upper heap frame pointer always points to the last allocated byte of memory). If the two frame pointers cross each other, there is not enough memory to satisfy the request.

**frame buffer** A hardware device that provides an interface for a frame of computer data to the monitor. It contains memory to store the color of each pixel together with circuitry to manage input to the memory and output in a form that can be accepted by the monitor.

**frame buffer synergy** The use of image memory in such a way that it may store the output of one program which can be used as the input for another program.

**frame-by-frame animation** Animation using a series of *keyframes* with no *tweening* that creates a "flipbook." An animation *Flash* file is an example of a frame-by-frame animation.

**frame grabber** A device that converts a video picture into a digital file.

**frame rate** 1. In video or film recording, the number of frames per second that are recorded (and then played back). 2. In computer games, especially 3D games, the rate at which frames are created and displayed on the computer screen, just like the frames of a movie. One critical difference, however, is that when a movie's frame rate suddenly drops to half speed, the film itself is playing half speed. In a game, when the frame rate drops, the "world" is still moving at the same speed, but the player is seeing half as many frames. So the action the player is watching is still running at the same speed, but the motion appears choppy.

**frames per second (fps)** Used to describe the speed at which film and video play. Film plays at 24fps, PAL video at 25fps, and NTSC video at 29.97 fps. Frame speed can seriously affect the quality of video games as it relates to "real-time rendering."

**Frax4D/FraxFlame/FraxE** series of *Photoshop* plug-ins. KPT volume. Each can be fractal-based imagery.

**free-form** An image that hand without use of rulers other mechanical devices.

**free form model** A model cylinder that is created by square or circle. Free form correspond better to the use of do primitive models.

**Free Form Modeler** A modeler in *Carrara* that works by an extrusion method that is defined by profiles in all three dimensions.

**FreeHand** A high-end Macromedia vector-graphics application. Macromedia Freehand is a professional solution for designers publishing in print and on the Web, offering sophisticated illustration tools, time-saving productivity features, and integration with the family of Macromedia publishing software, including Macromedia Flash.

**freehand lasso** A tool used in

tions to select areas for modification.

**freeview** A simple technique for three-dimensional viewing that places images side by side, left on the left and right on the right. The viewer keeps the axes of the eyes parallel, looking at infinity, while focusing on the display. Initially, this is difficult and some practice may be required.

**polynomial** A curve by a polynomial.

in which a circle is divided into segments, each representing a fraction of the whole having

in Java to denote a arc with color. Since figure, some are made as to how it is used, Java draws a straight line from each the center of the un-ellipse and then fills the figure with color.

nable artifact that occurs in scan lines of insufficient resolution to create letters. A wheel that presses against the capstan assure to assure that remains constant during

ortion of the image in which the middle of and sides of the display

infinite exchange of two patches that face calculating radiosity by using patches or meshes that are facing each other, once back and forth

the simplest form of of a box with a pinhole of one wall and a hole inside of the other the pinhole is small

enough, it acts as a good-quality lens of very small aperture.

**pink noise** A completely random amplitude signal whose power is inverse to frequency. Also known as  $1/f$  noise.

**pipelining** The partitioning of a computation into stages that can be executed sequentially in separate processing elements. This reduces total processing time when a number of similar computations are involved.

**pistol-grip tripod** A tripod with a head that is controlled by a single pistol-grip mechanism. Such heads can be freely rotated around all axes simultaneously, making it very difficult to perform a smooth motion along a single axis.

**pit** A laser-created indentation in an optical disk that represents a bit of data.

**pitch** 1. The number of characters per inch in a line of text, measured horizontally. This number is meaningful only for fixed spacing fonts, since proportional fonts

have a different *pitch* for every character. 2. The angular displacement of an object about the x axis in the x-y plane. 3. The distance between the centers of RGB phosphor triads on a cathode ray tube screen.

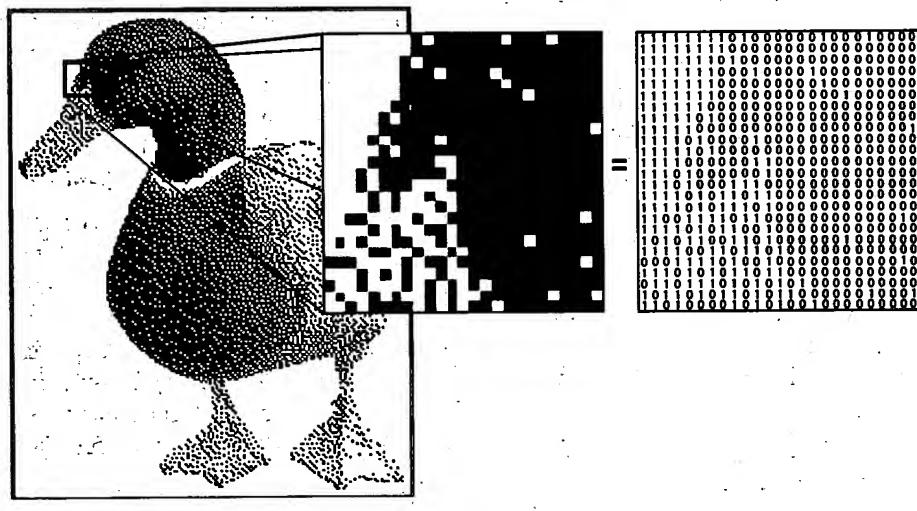
**pixblt** See *bitblt*.

**pixel** Short for *picture element*. A single element of a discrete display. Also known as a *pel*.

**pixel aspect ratio** The ratio of the horizontal length of a pixel to the vertical length of the pixel. Computer monitors have square pixels. However, pixels are rectangular in some video formats. In order to work with such formats on a computer monitor, software that corrects the picture on the monitor is required.

**pixelation** An effect created when a texture map with insufficient resolution is mapped onto a surface.

**pixellation** A video effect in which an image is divided into a grid containing



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**region of interest (ROI)** A portion of an image that is selected for further examination or processing.

**registration** The alignment or degree of alignment of two or more images that are to overlay. For example, in color printing, the red, green, yellow, and black ink images must register exactly to produce a quality color picture.

**regularized Boolean set operations** Operations of Boolean algebra that are defined in such a way that operations on solids always yield solids.

**relative address** The address of a datum in computer memory with respect to some reference address already stored in the computer. The sum of the reference address and the *relative address* should be the *absolute address* of the datum. Compare with *absolute address*.

**relative index of refraction** A measure of the amount of light that is refracted when a light ray passes through the surface of two dissimilar materials.

**relaxation techniques** Techniques in which an object that is required to meet certain constraints is moved so that the constraints become closer to being satisfied.

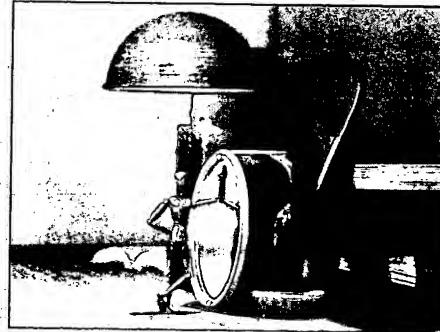
**release print** A print of a film that is sent to a theater for projection.

**Rembrandt lighting** The placement of a key light to the side of the camera with the light focused on the subject. The position of the key light in Rembrandt lighting is normally elevated above and placed to the side of the subject in portraiture. This placement illuminates three-quarters of the subject's surface. Rembrandt lighting is derived from the position of the sun in late morning or

late afternoon, when it is above and to the side of the subject. The light at this position is flattering in the way it models the subject into a three-dimensional form. The contours and form of the face are revealed. This is the classic position of key light in painting and photography. Also known as *¾ lighting*, *quadrant lighting*, or *45-degree lighting*.

**remote procedure call (RPC)** A software function that is used while a computer is running another program, enabling it to run a subprogram on another computer in the same network.

**render** The computer process of taking the three-dimensional model with its accompanying textures and lights, and turning that into a two-dimensional image composed of an array of pixel colors. In simplest terms, when a computer "renders" it paints all the information thus far created. 



render.

**Render** An icon in *trueSpace* that allows the user to select such options as ray-tracing and antialiasing.

**renderfarm** A group of computers used to render a single animation. Each computer in the series renders every x number of frames.

encoded as a sequence of addresses to a table of small blocks of pixels that are relatively close representations of blocks of pixels in the original image. This technique is known as *vector quantization* because each block of pixels represents the components of a vector and attempts to find vectors that are close together.

**vectorscope** A special monitor for calibrating the hue, or color information, in a video signal.

**vector space** A space consisting of a set of elements, called *vectors*, where addition and multiplication by a constant can occur.

**Vectorworks** A 2D/3D vector graphics application from Nemetschek. For direct rendering of *Vectorworks* drawings, the *Renderworks* plug-in may be appropriate.

**vergence** When one holds his index finger about 14 inches from his face and slowly brings it closer until his eyes can no longer focus on it clearly, there is, at that point, a perceptible image disparity. The eyes looking at an object 300 feet away, however, do not detect a discernible disparity. This is because each image on the retina is almost identical, and there are no eye muscle strains. As the image gets closer, however, the eyes begin to experience image disparity as well as eye strain. This experience generates the sixth eye movement, which is called *vergence*. To gauge distance, the brain strains the eye muscles.

**verification suite** A set of tests developed to verify that a program meets all of its specifications. Use of the verification suite is essential to ensure that program modifications do not introduce secondary bugs.

**verso** In typography, the left-hand page of a book or magazine. The right-hand page is known as the *recto*.

**vertex** A point which marks the intersection of two or more edges of a polygon or other graphics object.

**vertex collapse** Deciding which edge of a mesh is least significant and removing this edge by making the two vertex positions at its ends equal. This edge collapse operation typically makes two triangles sharing the edge redundant. Detail is put back into the mesh by reversing these collapses through vertex splits.

**vertex level deformation** A technique, available in many 3D applications, that enables the programmer to see the vertexes where polygons meet to pull and push those points. It simulates "virtual clay." Many programs show the vertex points as Bezier handles or spline points. This assists in creating smooth deformations so the programmer can "pull" those points out to make a rounder face.

**vertex normal** A normal vector at a vertex of a graphics object. Rather than being normal to one of the intersecting surfaces, it is normal to the average of the surface normals of all of the intersecting surfaces.

**Vertex Paint** A modifier in *3ds max* that allows the user to paint the selected vertices of an object different hues.

**vertical banding** Bright vertical smears that can occur in some video cameras when the camera is pointed at a very bright source.

**vertical blanking interval** The period during which a video image goes blank as the electron beam returns from scanning

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